Canadian Centre for Occupational Health and Safety

Centre canadien d'hygiène et de sécurité au travail

The Material Safety Data Sheet

A Basic Guide for Users

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THE MATERIAL SAFETY DATA SHEET

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THE MATERIAL SAFETY DATA SHEET--A BASIC GUIDE FOR USERS

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INTRODUCTION

A Material Safety Data Sheet (MSDS) provides basic information on a material or chemical product. It contains information on the properties and potential hazards of the material, how to use it safely, and what to do if there is an emergency.

This document guides the non-technical person through the MSDS. It explains the information needed to understand the hazards and precautions necessary for the safe use of a chemical product.

MSDSs from different companies may not look the same but they should contain the same basic information. This guide is organized using the sections and headings appearing on a sample MSDS (Figure 1) which is typical of those being written today.

MSDSs are written for several audiences other than supervisors and workers using the material--firefighters, physicians, occupational hygienists, safety supervisors, engineers and environmental specialists, among others. The information used by one group may not be needed by another. Thus, there may be information on an MSDS which you do not need.

The MSDS is an essential <u>starting point</u> for the development of a complete health and safety program for the material. However, MSDSs are not complete sources of information on their own. Most MSDSs are prepared by the manufacturer or supplier of the material. Therefore, they tend to be general in nature, since they provide summarized information which can apply to a variety of work situations. As well, there are local laws which must be followed. These laws are not generally described on the MSDS.

When you read an MSDS, you should keep in mind that there are three types of hazards which can be related to the use of a chemical product:

- Health Hazards. For example, skin contact with strong acids will cause burns.

- Fire Hazards. For example, propane burns very easily and may explode.

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- Reactivity Hazards. For example, mixing ammonia and household bleach will result in the release of a harmful gas.

You should make certain that the MSDS describes the preventive and emergency-response measures for all of the potential hazards of the material. A review of the most important questions to answer when reading an MSDS is found on page 22.

Additional information and advice about the material is available from a number of sources, including your supervisor, your health and safety committee, your company or union health and safety specialists, the manufacturer, the supplier, occupational health and safety consultants, the government body responsible for occupational health and safety in your jurisdiction, and the Canadian Centre for Occupational Health and Safety (CCOHS).

Some specialized or technical terms are frequently used on MSDSs. The meaning of these terms can be found in the CCOHS publication "The Material Safety Data Sheet--An Explanation of Common Terms."

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Figure 1 - Sample Material Safety Data Sheet

MATERIAL SAFETY DATA SHEET

SECTION I - PRODUCT IDENTIFICATION AND USE

Product Name/Material Name/Trade Name	Product Code
Manufacturer's Name and Address	Supplier's Name and Address
Business No. Emergency No.	Business No. Emergency No.
Product Use	

SECTION II - HAZARDOUS INGREDIENTS

Hazardous Ingredients	Approximate Amount (%)	C.A.S. Numbers	Exposure Limits

SECTION III - PHYSICAL DATA

Physical State - ☐ Gas ☐ Liquid ☐ Solid

Appearance and Odour	
Odour Threshold (ppm)	Specific Gravity
Vapour Pressure (mm Hg)	Vapour Density (air = 1)
Evaporation Rate	Boiling Point (°C)
Freezing Point/Melting Point (°C)	Solubility in Water (20°C)
% Volatile (by volume)	pH
Density (g/ml)	Coefficient of Oil/Water Distribution

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flammable - ☐ Yes ☐ No If YES, under which conditions?

Extinguishing Media	TDG Flammability Classification
Flash Point (°C) and Method	Autoignition Temperature (°C)
Upper Explosive Limit (% by volume)	Lower Explosive Limit (% by volume)
Special Procedures	Hazardous Combustion Products
Explosion Data	
Sensitivity to Mechanical Impact	Sensitivity to Static Discharge

SECTION V - REACTIVITY DATA

Stable - ☐ Yes ☐ No If NO, under which conditions?

Hazardous Polymerization - ☐ Yes ☐ No If YES, under which conditions?

Incompatibility with Other Substances - ☐ Yes ☐ No If YES, which ones?

Hazardous Decomposition Products

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SECTION VI - TOXICOLOGICAL PROPERTIES / HEALTH HAZARD DATA	
Route of Entry/Exposure ☐ Skin Contact ☐ Skin Absorption ☐ Eye Contact ☐ Inhalation ☐ Ingestion	
LD_{50}	LC_{50}
Effects of Acute Exposure to Product	
Effects of Chronic Exposure to Product	

SECTION VII - FIRST AID MEASURES			
Skin	Eye	Inhalation	Ingestion

SECTION VIII - PREVENTIVE MEASURES		
Engineering Controls (eg. ventilation, enclosed process)		
Personal Protective Equipment		
Gloves (Type of Material)	Respiratory Protection	Eye Protection
Clothing	Other	

SECTION IX - STORAGE AND HANDLING
Storage Requirements
Handling Procedures and Equipment

SECTION X - SPILL AND LEAK PROCEDURES
Clean-up
Waste Disposal

SECTION XI - ADDITIONAL INFORMATION
Special Shipping Information
Sources Used

Prepared by (group, department, etc.)	Phone Number	Date

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I. PRODUCT IDENTIFICATION AND USE

MATERIAL SAFETY DATA SHEET			
SECTION I - PRODUCT IDENTIFICATION AND USE			
Product Name/Material Name/Trade Name		Product Code	
Manufacturer's Name and Address		Supplier's Name and Address	
Business No.	Emergency No.	Business No.	Emergency No.
Product Use			

The first thing you should do when you receive an MSDS is make sure you have the right MSDS for the material with which you are working. The Product Identification and Use section gives you the information you need to ensure that the MSDS is the right one.

The product name, material name or trade name on the MSDS should be exactly the same as the name on the product label. You should look for a specific identifier such as a series of numbers and/or letters on the label. Depending on the company, this identifier may be called a product code, a product reference number, or a catalogue number. This specific identifier should also match the MSDS. The identifier is particularly important if the product name applies to a group or line of products.

The information on product use can confirm that you are using the material as the manufacturer or supplier intended and to further check that you have the correct MSDS.

If your use is not listed on the MSDS, you should contact the manufacturer or supplier to ensure that the material can be used safely in your application and to make certain you have the correct MSDS. The information on the MSDS may not apply to your situation if you are using the material for a different application than was intended.

Materials may come into the workplace in containers from the original manufacturer, or they may be repackaged by a supplier or distributor. The supplier or distributor is the company which provides the material directly to your company. In some cases, the manufacturer and supplier are the same.

If the manufacturer's or supplier's name and address are given on the label, check them against the MSDS to further make certain that you have the right MSDS.

You can use the telephone number provided to obtain more information if you need it. The person who prepared the MSDS (usually listed at the end of the MSDS) is a good starting point. Sometimes, the MSDS gives a special telephone number for emergency assistance.

It is very important that you have an up-to-date MSDS. The date the MSDS was prepared is usually found at the end of the MSDS. If you are not sure that the MSDS is current, contact the manufacturer or supplier. No MSDS should be more than three years old.

II. HAZARDOUS INGREDIENTS

SECTION II - HAZARDOUS INGREDIENTS			
Hazardous Ingredients	Approximate Amount (%)	C.A.S. Numbers	Exposure Limits

All of the potentially hazardous ingredients of the material must be listed on the MSDS. The approximate amount (percentage) of each ingredient of the material must also be given.

In some cases, an ingredient considered to be a trade secret will not be identified. If an ingredient meets the legal criteria for a trade secret, this will be indicated on the MSDS. Regardless of whether an ingredient is a trade secret, the potential hazards associated with that ingredient must be described on the MSDS.

Depending on the MSDS, you may find exposure limits in the Hazardous Ingredients section, the Toxicological Properties section or the Preventive Measures section.

MSDSs usually give common exposure limits such as TLVs (Threshold Limit Values) which are published by the American Conference of Governmental Industrial Hygienists (ACGIH). However, Canadian legal exposure limits can be different depending on your jurisdiction (provincial, territorial or federal). Your company must follow the applicable legal limits, which are not necessarily those listed on the MSDS.

Other information about the ingredients of the material, for example the Chemical Abstracts Service (CAS) number, may be included in this section. This information can be used to confirm the identity of an ingredient or to obtain additional information.

III. PHYSICAL DATA

SECTION III - PHYSICAL DATA	
Physical State - ☐ Gas ☐ Liquid ☐ Solid	
Appearance and Odour	
Odour Threshold (ppm)	Specific Gravity
Vapour Pressure (mm Hg)	Vapour Density (air = 1)
Evaporation Rate	Boiling Point (°C)
Freezing Point/Melting Point (°C)	Solubility in Water (20°C)
% Volatile (by volume)	pH
Density (g/ml)	Coefficient of Oil/Water Distribution

The Physical Data section describes the material and gives technical information on its properties.

You should check that the description of the material (the physical state and appearance) is the same as the material you plan to use or are using. If it is not, you may not have the correct MSDS. Also, the material may be old or may have decomposed during shipping or storage. In either case, the information on the MSDS may not apply and you should obtain additional advice.

The rest of the information in this section is used to help determine the conditions under which the material may be hazardous. Technical specialists use this information to develop specific work site procedures for exposure control, storage, handling, spill clean-up and so on.

The different physical properties commonly given on an MSDS are explained in the CCOHS publication "The Material Safety Data Sheet--An Explanation of Common Terms."

IV. FIRE AND EXPLOSION HAZARD DATA

SECTION IV - FIRE AND EXPLOSION HAZARD DATA	
Flammable - ☐ Yes ☐ No	If YES, under which conditions?
Extinguishing Media	TDG Flammability Classification
Flash Point (°C) and Method	Autoignition Temperature (°C)
Upper Explosive Limit (% by volume)	Lower Explosive Limit (% by volume)
Special Procedures	Hazardous Combustion Products
Explosion Data	
Sensitivity to Mechanical Impact	Sensitivity to Static Discharge

The purpose of the Fire and Explosion Hazard Data section is to describe the nature of the fire hazard of the material. The information provided here can be used to plan the appropriate type and placement of fire extinguishing agents and the best response to a fire for a particular work site. Most of the information in this section is intended for firefighters and emergency response personnel.

If the material is a potential fire hazard, you should know the special handling precautions or other control measures required to prevent a fire. You should also know the emergency procedures to follow in case of a fire at your work site.

V. REACTIVITY DATA

SECTION V - REACTIVITY DATA
Stable - ☐ Yes ☐ No If NO, under which conditions?
Hazardous Polymerization - ☐ Yes ☐ No If YES, under which conditions?
Incompatibility with Other Substances - ☐ Yes ☐ No If YES, which ones?
Hazardous Decomposition Products

The Reactivity Data section describes how stable the material is and any conditions under which it can react dangerously. Unstable materials may break down to chemicals which have different hazards. For example, the new chemicals may be more toxic than the original material. Conditions such as heat, sunlight, and age of the chemical can cause unstable chemicals to break down. These unstable materials require special storage and handling precautions.

Materials which are incompatible may react violently or explosively if they are mixed or brought together. These materials should be stored separately and should not be mixed unless special procedures are followed.

You need to be aware of the information in this section so you can avoid mixing incompatible materials or storing a material unsafely.

VI. TOXICOLOGICAL PROPERTIES/HEALTH HAZARD DATA

SECTION VI - TOXICOLOGICAL PROPERTIES / HEALTH HAZARD DATA	
Route of Entry/Exposure ☐ Skin Contact ☐ Skin Absorption ☐ Eye Contact ☐ Inhalation ☐ Ingestion	
LD_{50}	LC_{50}
Effects of Acute Exposure to Product	
Effects of Chronic Exposure to Product	

The Toxicological Properties section describes the ways you can be exposed to the material and the harmful effects it can have.

The health effects information should be considered general since a particular material will not affect everyone the same way. In addition, the way in which a material is used can influence the nature of the health hazard.

Sometimes, the MSDS will describe effects of the material on animals. This information is usually included when there is a lack of information about the effects of the material on people. When reading about the effects of the material on animals, it is important to remember that the effects are not necessarily the same for people. However, with careful interpretation, animal data can add to our understanding of how the material can affect people.

Sometimes medical terms are used to describe the possible health effects. If there are words you don't understand, ask for assistance from someone familiar with the use of medical terms to find out what they mean, for example, a nurse or a doctor. Even a medical dictionary will not always provide a complete or understandable definition.

You need to know the potential health effects of the material because they underline the importance of following safe work practices and wearing appropriate protective equipment.

You also should give the health effects information to your family doctor. This will help your doctor follow your work history and to monitor your health and relate any symptoms you have to a possible workplace overexposure.

Routes of Entry/Exposure

The information under the Routes of Entry heading describes how you can be exposed to the material. Chemicals can cause harm either at the point of contact, by absorption into the body, or both. Chemicals absorbed into the body can affect body systems and organs far away from the point of entry. For example, phenol absorbed through the skin can cause kidney failure.

The possible routes of entry are the skin, the eyes, the respiratory system (through inhalation), and the digestive (gastrointestinal) system (through swallowing). How important each route of entry is for a particular material depends on many factors, such as the physical properties of the material and how it is used.

More details on routes of exposure are available in the CCOHS publication "How Workplace Chemicals Enter the Body."

Effects of Acute Exposure to Product

An acute exposure is a short-term exposure. Short-term means for minutes, hours or days.

The health problems caused by an acute overexposure are usually seen at the time of exposure. However, sometimes, related health effects may not appear for several hours or even days after an overexposure.

You need information on the typical effects of a short-term overexposure because symptoms can alert you that you are being accidentally overexposed. For example, workplace control measures may have failed. Any symptoms you experience which may be associated with use of a material should be reported so that your workplace can be investigated to find out the cause. Possible reasons for the symptoms can vary widely. For example, perhaps the material has passed through your gloves, or the ventilation system is not working effectively. Sometimes the symptoms may not be related to an overexposure at work--they may be caused by a cold, for example.

Usually, the effects of overexposure to a low concentration of the material are described first. The MSDS may then go on to tell you the possible effects of a moderate or severe overexposure. You need to know the nature of these symptoms so that you can recognize the potential seriousness of an overexposure.

Effects of Chronic Exposure to Product

A chronic exposure is a long-term exposure. Long-term means over months or years. This type of exposure may also be described as prolonged, meaning very long, or repeated, meaning many exposures.

Any illness related to a long-term overexposure may develop very slowly or may not appear until many years after the exposure has stopped. You should be aware that at the time of the overexposure you may experience no warning symptoms but an illness possibly related to the overexposure may appear months or years later. For example, if you are overexposed to asbestos you may not experience any respiratory symptoms at the time but may develop lung cancer many years later. Therefore, it is important that you follow all hazard control procedures established for your job.

VII. FIRST AID MEASURES

SECTION VII - FIRST AID MEASURES			
Skin	Eye	Inhalation	Ingestion

The First Aid Measures section describes actions to be taken immediately in case you are overexposed to the material. The purpose of first aid is to minimize injury and future disability. In serious cases, first aid may be necessary to keep the victim alive.

You need to know first aid information before you start working with the material. There is no time to find and read the MSDS during an emergency. First aid procedures should be periodically reviewed by everyone working in areas where the material is handled. Everyone should know the location of the facilities and equipment for providing first aid: for example, the eyewash fountain and the first aid kit.

Knowing the first aid procedures for materials used in a work area is also necessary so that people will have the appropriate first aid skills. In most cases, only basic first aid training is needed. Sometimes, you may need advanced training: for example, for the administration of cardiopulmonary resuscitation (CPR) or oxygen.

Often, the first aid procedures on an MSDS are for a "worst case" overexposure. The first-aider should evaluate how severe the overexposure is before using the full first aid procedure. Formal first aid training will help you make this decision. However, if you are not sure, follow the instructions given on the MSDS.

When medical treatment is necessary, send the MSDS, if it is readily available, to the emergency facility with the victim. If the MSDS is not available, you should send the material's label or a labelled container of the material, if it is small enough. The medical personnel need to know what the material is and what first aid measures have been recommended and used. Occasionally, the MSDS has additional instructions which may be useful to the emergency doctor: for example, it may say, "Monitor kidney function for 24 hours."

VIII. PREVENTIVE MEASURES

SECTION VIII - PREVENTIVE MEASURES		
Engineering Controls (eg. ventilation, enclosed process)		
Personal Protective Equipment		
Gloves (Type of Material)	Respiratory Protection	Eye Protection
Clothing	Other	

The section on Preventive Measures provides information which is used to develop a program for working safely with the material. All of the possible hazards (fire, reactivity and health) are considered when developing a complete hazard control program. The MSDS usually provides information on two general ways for controlling hazardous conditions--engineering controls and personal protective equipment.

The MSDS commonly gives general precautions for safe handling in a normal use situation. However, different controls may be necessary for your job because of the way the material is used and the controls already in place. You need to know the specific hazard controls necessary for your job so you can work with the material safely.

Engineering Controls

Engineering control systems reduce potential hazards either by isolating the person from the hazard or by removing the hazard from the work environment. They include mechanical ventilation and process enclosure. Engineering control systems are important because they are built into the work process to reduce the hazards.

Substitution of a less hazardous material or industrial process is the best way to reduce a hazard, but engineering control systems are the next best option. Engineering controls are preferred to other control measures such as the use of personal protective equipment. This is because engineering controls either control the potential hazard at its source, or put up a permanent barrier between the worker and the potential hazard.

The MSDS does not usually provide the specific details of the engineering controls (for example, ventilation rates, fan size and so on). This is because the controls must be designed to suit the individual work site.

You need to make sure that engineering control systems recommended for your job are properly maintained and are operating when you are working with the material. If the process changes, the controls may have to be changed as well.

Personal Protective Equipment

Guidance on the need for and selection of personal protective equipment such as protective clothing, eye protection and respiratory protection is provided under this heading.

Protective Clothing

Protective clothing includes items such as gloves, aprons, full body suits, and boots. The MSDS should tell you the material of which the protective clothing should be made. This is because no one material acts as a barrier to all chemicals. For example, polyvinyl alcohol (PVA) provides excellent protection against toluene diisocyanate but offers poor resistance to trichloroethylene. Sometimes, the MSDS may only say to use impervious (resistant) materials. In this case, you have to get information about the exact material of which the clothing should be made. You may be able to obtain this information from the product supplier or manufacturer or from a protective clothing supplier or manufacturer.

Whenever possible, you should wear protective clothing which is resistant to all the potentially hazardous chemicals to which you may be exposed while performing a particular task.

Eye Protection

Under this heading, the MSDS describes the type of eye protection you may need when handling the material. The most common types of eye protection recommended are safety glasses and chemical safety goggles.

Respiratory Protection

There are many different types of respirators. The correct type of respiratory protection can change as the amount of the material in the air changes. Also, one type of respirator may be effective against some kinds of chemicals but may provide little or no protection against others. Complete respiratory protection guidelines usually cannot be given on the MSDS

because there is not enough room or because of the lack of specific information about the job. The selection of the best respirator for you can be quite complicated and usually requires a work site assessment. This assessment should be done by someone who knows your operations and who knows how to evaluate potentially hazardous conditions.

If respirators are required at your work site, a complete respiratory protection program including respirator selection, fit testing, training and maintenance is necessary.

Depending on the job, you may have to use personal protective equipment all the time, part of the time, or only in an emergency. You should know which protective equipment is necessary for your work. You also need to know where, when and how to use your protective equipment and how to recognize problems with it. As well, you need to know how to maintain your personal protective equipment.

Sometimes, there may be no information about personal protective equipment on the MSDS. If a potentially hazardous exposure is possible in your job, you should check the routes of entry in the Toxicological Properties section. If a certain type of exposure is possible and the route of entry is indicated, you should get advice about the need for you to wear protective equipment. For example, if you have hand contact with a material which can damage or be absorbed through the skin, you may need to wear protective gloves.

IX. STORAGE AND HANDLING

SECTION IX - STORAGE AND HANDLING
Storage Requirements
Handling Procedures and Equipment

Storage Requirements

Information provided under this heading gives advice about the conditions necessary to store the material safely. For example, "store in a cool, dry, well-ventilated area away from heat and ignition sources" is commonly used to describe storage conditions for materials which can burn. The MSDS may also give information about the types of chemicals which should NOT be stored with the material.

The storage recommendations are a good starting point for deciding where and how materials should be stored. In order to design a safe storage area, more specific information about your work site is usually needed. You need to know the specific storage procedures for materials used at your work site.

Handling Procedures and Equipment

You will usually find general precautions necessary for the safe use of the material under this heading. For example, the MSDS may suggest electrical grounding of containers for a flammable liquid. These instructions may or may not apply to your work, depending on how the material is used and the hazard control measures already in place. An assessment of your work will determine the best handling precautions for your particular case. You need to know the specific handling procedures for your job.

X. SPILL AND LEAK PROCEDURES

SECTION X - SPILL AND LEAK PROCEDURES
Clean-up
Waste Disposal

Clean-Up

General instructions for cleaning up a spill are provided in this section. The information is used by the people who are responsible for planning emergency response procedures for a spill. Usually, special training is required to clean up a spill or leak safely. You should know your own work site emergency response plan.

Waste Disposal

The waste disposal information is used by people who are responsible for developing waste disposal procedures. However, the MSDS does not usually contain all the steps and precautions necessary for hazardous waste disposal. As well, the MSDS often does not give the federal, provincial, or local regulations which must be followed. The appropriate authorities for your area should be contacted for this information.

XI. ADDITIONAL INFORMATION

SECTION XI - ADDITIONAL INFORMATION
Special Shipping Information
Sources Used

Prepared by (group, department, etc.)	Phone Number	Date

The Additional Information section is used to provide supplementary information which the author of the data sheet considers important for the safe use of the material. Reference sources used in preparing the data sheet are sometimes listed. You can use this reference list to obtain additional information on the material.

CONCLUSION

It is important to remember that an MSDS is not a complete source of health and safety information on its own. This is because MSDSs are usually written for many different worksites and, therefore, cannot be specific in the advice they offer. They are, however, an essential starting point for developing a complete health and safety program for a material. The questions on the next page will help you identify the specific information you need to work safely with a material.

Important Questions to Answer When Reading an MSDS

Identification

Do you have the right MSDS for the material with which you are working or will be working?

Do you have an up-to-date MSDS?

Does the MSDS description of the material match the material you have?

Potential Hazards

Can this material burn or explode?

Is this material unstable? If so, under what conditions?

Can this material react with other chemicals? If so, which ones?

Can this material harm your health? Do you know the symptoms which may warn you of overexposure? Have you discussed the health effects information with your doctor?

Preventive Measures

Does your worksite need engineering controls?

Does this material require special handling precautions?

Do you need protective equipment?

Do you need to be careful when mixing this material with any other chemicals?

Does this material require special storage conditions?

Emergency Measures

Do you know what to do in case of a fire or explosion?

Do you know the first aid measures needed in case of an overexposure?

Do you know what to do in case of a spill or leak?

Do you know where the emergency response equipment is and how to use it?